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Research Article

THE EFFECT OF GALLIC ACID, NARINGIN, CHRISIN AND QUERCETIN AS FLAVONOIDS, ON THE THERMODYNAMIC STABILITY OF TYROSINASE

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Abstract

Background: Tyrosinase is a copper-containing monooxygenase responsible for the biosynthesis of melanins and other polyphenolic compounds. Since tyrosinase function lead to the different biological process through animals and its deficiency may cause problems, thus the study of its activation or stabilizations is as important as its inhibition. **Method:** The thermodynamical stability and inhibition of mushroom tyrosinase (MT) from Agaricus Bisporus were investigated in the presence of gallic acid, naringin, chrisin, quercetin. Therefore, the protein denaturation and thermal scanning was studied. Sigmoid denaturation curves were analysed according to the two models of Pace theory to obtain the Gibbs free energy change of denaturation process. **Results and conclusion**: In the presence of gallic acid, kinetic assessment of the enzyme activity showed a non-competitive inhibition and the chrysin, naringin and quercetin induced a competitive inhibition.. Although these flavonoids induced MT thermal and chemical stability, the $\Delta G°H2O$ magnitudes for sole enzyme, in presence of gallic acid, naringin, chrysin and quercetin was obtained 6.39, 7.21, 6.77, 8.56, and 8.04 respectively. Also, the melting points (Tm) of enzyme in above conditions from thermal denaturation were calculated 56.2, 62.62, 59.09, 57.53 and 57.22oC, respectively. So, these flavonoids, induced physico-chemical stability of tyrosinase.

Keywords: Flavonoids; Tyrosinase; Enzyme stability.

Introduction

Tyrosinase (EC 1.14.18.1) is a copper-containing monooxygenase responsible for the biosynthesis of melanins and other polyphenolic compounds (Uchidaa et al., 2014). It catalyses both the orthohydroxylation of monophenols and the oxidation of o-diphenols to o-quinones. Tyrosinase is widely distributed in mammals, plants and micro-organisms and plays a crucial role in melanogenesis as the key enzyme (Kim et al., 2012). Mushroom tyrosinase has a molecular mass of 120 kDa that catalyzes the hydroxylation of tyrosine to 3,4-dihydroxyphenylalanine (L-DOPA), and L-DOPA to DOPA quinine (Ha et al., 2011). Quinones chemically evolve to give rise to melanins or react with amino acids and proteins to enhance the colour products, which are brown, black, or red heterogeneous polymers (Huang et al., 2006).